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FLOOD INSURANCE STUDY

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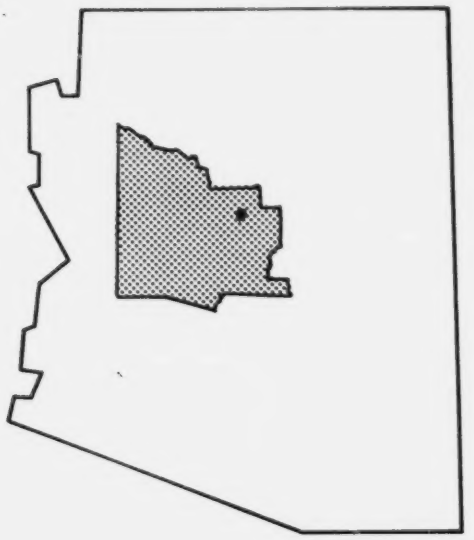

TOWN OF CLARKDALE, ARIZONA
YAVAPAI COUNTY

JUNE 1, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER-040095

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Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Clarkdale, Yavapai County, Arizona, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert Clarkdale to the regular program of flood insurance by the Federal Emergency Management Agency. Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1(d). In such cases, however, it shall be understood that the State (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by Cella, Barr, Evans and Associates, for the Federal Emergency Management Agency, under Contract No. H-4607. This work, which was completed in November 1979, covered all significant flooding sources affecting Clarkdale.

1.3 Coordination

The Consultation and Coordination Officer appointed by the Federal Emergency Management Agency organized the first community meeting held on August 8, 1977. This meeting, attended by representatives of the Towns of Cottonwood and Clarkdale, the Federal Emergency Management Agency, and the study contractor, was held to explain the nature and purpose of the Flood Insurance Study and to determine the limits of detailed and approximate studies within the Town of Clarkdale.

The Arizona Water Commission served as the State coordinating agency for this study.

Contact was maintained during the course of this study with the U.S. Geological Survey; the U.S. Army Corps of Engineers; the U.S. Soil Conservation Service; the Arizona Department of Transportation; the Town Clerk of Clarkdale, Arizona; the Yavapai County Engineering Department in Prescott, Arizona; and Verde Valley Realty for general community information.

On January 24, 1980, the results of this study were reviewed at an intermediate-final consultation and coordination meeting which was attended by representatives of the Town of Clarkdale, the Federal Emergency Management Agency, and the study contractor. No significant changes resulted from this meeting.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Clarkdale, Yavapai County, Arizona. The area of study is shown on the Vicinity Map (Figure 1). The Yavapai Apache Indian Reservation is not included in this study.

The following stream channels were originally designated for study by detailed methods: Verde River, Deception Wash, Bitter Creek, Bitter Creek-South Fork, and Minguez Wash. Detailed study methods were terminated for Minguez Wash in Clarkdale, because the extent of the drainage basin area contributing to this stream channel was less than 1 square mile, and the flood plain was less than 200 feet in width. The stream channels designated for study by approximate methods included Mescal Gulch and North Fork Mescal Gulch.

Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1984.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by the Federal Emergency Management Agency and the Town of Clarkdale.

2.2 Community Description

The Town of Clarkdale is in the northeastern corner of Yavapai County, approximately halfway between Flagstaff and Prescott, in central Arizona. This community was founded in the early 1900s as a result of mining developments. The 1970 population of the

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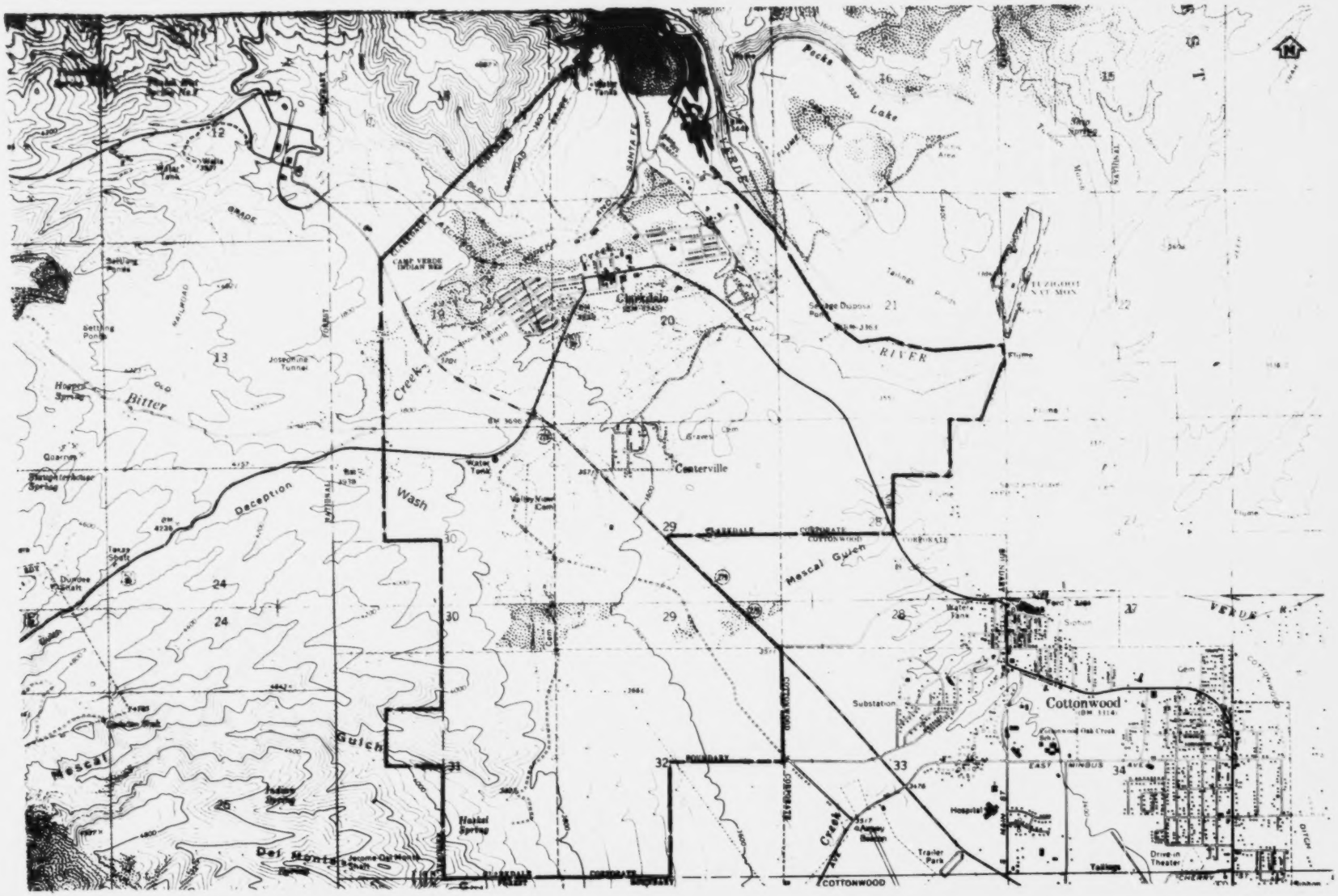
Clarkdale
Centerville
Cottonwood
Verde River
Bitter Creek
Deception Wash
Mescal Gulch
Mescal Gulch
Del Monte
Hopkins Spring
Indian Spring
Hoskel Spring
Josephine Tunnel
Jerome Gil Mond Shaft
Trailer Park
Drive-in Theater
Substation
Hospital
Tailings
Verde River
Peck's Lake
Santa Fe
Atchison Topeka
Railroad
Grade
Setting Ponds
Quarry
Dump
Water Tank
Valley View Cem.
Gem
Adit
Shaft
Prospect
Tramway
Ore Bin
Aerial Tram
Ditch
Creek
Gulch
Wash
Lake
River
Hospital
Trailer
Park
Drive-in
Theater
Tailings
Ditch
Creek
Verde
River
Cottonwood
Oak Creek

town was 892, and the 1978 population was estimated to be near 1200 (Reference 1).

Clarkdale is in a mountainous region that extends northwest and southeast through central Arizona. The town itself is situated on pediments which form relatively smooth slopes along the base of the Black Hills immediately to the west. The pediment surfaces have been trimmed subsequent to their formation by a dendritic arrangement of gulches and arroyos. The depth of that dissection increases progressively toward Verde River. The soils in the area are of hydrologic type D with a moderately high runoff potential.

Vegetation in the area is primarily desert brush with an average surface cover of 20 to 25 percent.

Verde River flows along the northern and eastern corporate limits of Clarkdale and is the principal riverine system in the Verde Valley. Its drainage area encompasses 3218 square miles. Most of the Verde River flood plain areas in Clarkdale are undeveloped; however, a few houses along Rincon Street have been constructed within the flood hazard areas. The extremely well-defined stream channel and flood plain areas are the probable reason for the lack of past development in flood hazard areas.

The remaining stream channels (Deception Wash, Bitter Creek, Bitter Creek-South Fork, and Minguez Wash) are tributaries to Verde River. These streams all have headwaters which originate in the Black Hills west of Clarkdale.

The climate in the study area is a basically warm, semiarid type with an average daily maximum temperature of approximately 60°F in January and 100°F in July. The mean annual precipitation varies from 10 to 13 inches over the lower elevations of the study area, and up to 25 inches or more in the mountainous portions of the drainage basin.

2.3 Principal Flood Problems

Historic records of major floodflow events in the Clarkdale area indicate that many of these flows result in relatively little damage to property.

Historic floodflow events have been recorded on Verde River indicating flow magnitudes of 22,500 cubic feet per second (cfs) (December 6, 1967); 35,500 cfs (March 8, 1918); and 50,600 cfs (February 20, 1920). These discharge values have return periods between 10- and 50-year events as determined from gage records (1916 through 1920 and 1966 through 1979) compiled by the U.S. Geological Survey and subsequent log-Pearson Type III analysis. The February 21, 1920, event is the maximum flood of record and has an estimated

recurrence interval of 50 years. A recent flood occurred on February 7, 1980, with a discharge of 28,000 cfs and a 20-year recurrence interval.

2.4 Flood Protection Measures

There have been no Federal, State, county, or local efforts toward constructing flood protection measures for Clarkdale. It is unlikely that any structures will be proposed in the near future in view of the minimal development that has occurred within the flood plain areas.

Town officials intend to adopt an ordinance to delineate areas of flood hazards or to prohibit development in flood hazard areas based on this Flood Insurance Study.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual occurrence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

Peak discharge values for drainage channels in the State of Arizona, which have insufficient streamflow record available to allow for floodflow frequency computations, have been analyzed utilizing a method presented in the Arizona Department of Transportation

publication entitled Hydrologic Design for Highway Drainage in Arizona (Reference 2). This method is referred to as the Soil Conservation Service Method and consists of two different approaches which are a function of the drainage-area size. This method pertains to areas where existing and projected urbanization has a negligible influence on expected basin discharges. The streams studied by detailed methods in the Clarkdale area fall under this criteria, with the exception of Verde River where sufficient streamflow data are available to allow for a more sophisticated approach.

The magnitudes of the peak discharges to be utilized in this hydrologic investigation of Verde River were obtained from a floodflow frequency analysis compiled by the U.S. Geological Survey (18 years of record from 1916 to 1920, and 1966 to 1979) from gage data at a gaging station on Verde River near Clarkdale (gage No. 5040). This study computed peak flow values by the log-Pearson Type III distribution as recommended by the U.S. Water Resources Council (Reference 3).

Peak discharge values for streams studied by approximate methods were developed on the basis of an average expected discharge per acre from the contributing basin areas. Flood plain boundaries were developed from aerial photography and field surveys with specific reference for defining geologic boundaries with consideration of expected flows.

Peak discharge-drainage area relationships for streams studied by detailed methods are shown in Table 1.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of these flooding sources.

For those stream courses studied by detailed methods, flood elevations were determined utilizing the U.S. Army Corps of Engineers HEC-2 computer program for the computation of water-surface profiles (Reference 4). In order to simulate the character of stream channels and their adjacent overbanks, cross sections were compiled utilizing a topographic map of the stream channels specified for study by detailed methods (Reference 5).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Verde River					
At Corporate Limits With Cottonwood	3,272.00	22,362	52,015	69,699	124,971
Deception Wash					
At Confluence With Verde River	6.17	2,513	3,696	4,583	12,000
Bitter Creek					
At Confluence With Verde River	14.90	6,793	8,688	11,600	31,000
Downstream of Confluence With Bitter Creek-South Fork	16.96	6,793	8,688	11,600	31,000
Bitter Creek-South Fork					
At Confluence With Bitter Creek	1.91	1,156	1,733	2,167	5,800

Stream channel geometry used in this flood plain analysis was developed specifically for the Flood Insurance Study. Aerial photogrammetric methods were used to compile topographic maps of the stream channel and adjacent flood plain areas for developing the cross sectional geometry (Reference 5).

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the flooding sources and flood plain areas and from previous studies by the U.S. Army Corps of Engineers (Reference 6). The roughness coefficients used for Verde River were 0.035 for the channel and 0.100 for the overbank areas. Much of the overbank areas are covered with extremely dense vegetation. For the Bitter Creek-South Fork and Deception Wash, the roughness coefficient was 0.040 for the channel and 0.050 for the overbank areas. The roughness coefficients used for Bitter Creek were 0.040 for the channel and 0.050 for the overbank areas. The roughness coefficients for bridges and culverts were assumed to be equivalent to the channel Manning's "n" value.

The dimensions of backwater-producing structures were identified through field investigations and construction plans obtained from the Arizona Department of Transportation. The backwater effects of a structure that was assumed to fail during high-magnitude flow events were not included in the hydraulic analysis. This structure is an earthen flow-diversion dike along Verde River which was constructed for irrigation purposes.

The starting water-surface elevation for the Verde River profile was determined from a known water-surface elevation from the Flood Insurance Study for Yavapai County (Reference 7). Computations commenced at a point downstream of the corporate limits of the Town of Cottonwood, approximately 3 miles downstream from the corporate limits of Clarkdale. One hydraulic model was used to compute the water-surface profile from this point through to the limit of Verde River flows affecting Clarkdale. Starting water-surface elevations for the tributary streams, Deception Wash, Bitter Creek, and Bitter Creek-South Fork, were computed at normal depth at a cross section located within the 100-year flood plain limits of Verde River.

The hydraulic models of tributary streams to Verde River at Clarkdale determined that flow is in a supercritical mode within these channels; however, backwater computations (subcritical flow models) were utilized to compute the flow profiles. Critical depth was assumed at nearly every cross section for these tributary studies.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

The streams (Minguez Wash, Mescal Gulch, and North Fork Mescal Gulch) which were studied by approximate methods utilized the existing Flood Hazard Boundary Map (Reference 8) to aid in delineating flood hazard areas. Additionally, a HEC-2 analysis was used to compute the Minguez Wash flood plain area. These maps were checked in the field to ensure their validity.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Emergency Management Agency as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2400, with a contour interval of 2 feet (Reference 5).

The boundaries for the approximate study on Minguez Wash were delineated on the same maps in conjunction with the determined elevations. The boundaries for the remaining approximate-studied streams were delineated on aerial photogrammetric maps at a scale of 1:8400 (Reference 9).

In accordance with Federal Emergency Management Agency guidelines, approximate flood plains less than 200 feet wide were determined to be areas of minimal flood and have been deleted.

Flood boundaries for the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year flood boundary has been shown. Small areas within

the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the Federal Emergency Management Agency limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal-conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

An initial attempt to establish a floodway for Verde River on the basis of the 1.0-foot increase in 100-year water-surface elevation criteria resulted in significant flow velocity increases and created extreme backwater problems with the excessive encroachments. It was therefore necessary to limit the specified water-surface elevation increases to less than 1.0 foot.

The hydraulic modeling of tributary streams (Deception Wash, Bitter Creek, and Bitter Creek-South Fork) indicated that floodway encroachments would not be feasible in view of extremely high-velocity zones (approximately 10 feet per second). This applied to all tributary stream reaches within the corporate limits of Clarkdale. The floodways on these streams are coincident with the 100-year flood plain boundary as shown on the Flood Insurance Rate Map (published separately).

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Verde River								
A	300	323/250 [2]	5,651	12.3	3,334.8	3,334.8	3,334.8	0.0
B	790	370	6,108	11.4	3,336.5	3,336.5	3,336.5	0.0
C	1,280	489	7,740	9.0	3,338.6	3,338.6	3,339.1	0.5
D	1,780	660	8,095	8.6	3,340.5	3,340.5	3,341.1	0.6
E	2,280	702	8,213	8.5	3,341.0	3,341.0	3,341.6	0.6
F	2,780	630	8,716	8.0	3,343.4	3,343.4	3,343.9	0.5
G	3,280	422	5,329	13.1	3,344.5	3,344.5	3,344.9	0.4
H	3,790	356	4,265	16.3	3,345.3	3,345.3	3,345.6	0.3
I	4,220	454	8,340	8.4	3,350.0	3,350.0	3,350.8	0.8
J	4,290	402	5,481	12.7	3,350.2	3,350.2	3,350.8	0.6
K	4,790	336	4,901	14.2	3,350.2	3,350.2	3,351.0	0.8
L	5,300	285	5,698	12.2	3,354.7	3,354.7	3,355.3	0.6
M	5,810	314	5,173	13.5	3,355.2	3,355.2	3,355.8	0.6
N	6,310	327	4,342	16.1	3,356.8	3,356.8	3,356.8	0.0
O	6,545	342	6,752	10.3	3,362.2	3,362.2	3,362.2	0.0
P	7,045	491	5,747	12.1	3,362.2	3,362.2	3,362.2	0.0
Q	7,555	445/396 [2]	6,894	10.1	3,365.3	3,365.3	3,365.9	0.6
R	8,060	333/220 [2]	5,101	13.7	3,365.7	3,365.7	3,366.3	0.6
S	8,660	257 [3]	3,839	18.2	3,367.0	3,367.0	3,367.6	0.6
T	9,160	533/90 [2]	8,997	7.7	3,373.7	3,373.7	3,374.6	0.9
U	9,560	513 [3]	9,273	7.5	3,374.9	3,374.9	3,375.6	0.7
V	9,950	565 [3]	10,029	6.9	3,375.9	3,375.9	3,376.7	0.8
W	10,455	861 [3]	12,363	5.6	3,377.0	3,377.0	3,377.7	0.7
X	10,965	687 [3]	9,667	7.2	3,377.6	3,377.6	3,378.3	0.7
Y	11,465	552 [3]	7,532	9.3	3,378.0	3,378.0	3,378.6	0.6
Z	11,965	506 [3]	7,415	9.4	3,380.1	3,380.1	3,380.7	0.6

[1] Feet Above Corporate Limits [2] Width/Width Within Corporate Limits [3] Floodway Lies Entirely Outside Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

FLOODWAY DATA

VERDE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Verde River (Cont'd)								
AA	12,475	486 [2]	7,929	8.8	3,382.1	3,382.1	3,382.7	0.6
AB	12,975	367 [2]	5,373	13.0	3,382.1	3,382.1	3,382.6	0.5
AC	13,475	207 [2]	3,663	19.0	3,382.6	3,382.6	3,383.3	0.7
AD	13,975	474 [2]	8,439	8.3	3,387.7	3,387.7	3,388.4	0.7

[1] Feet Above Corporate Limits [2] Floodway Lies Entirely Outside Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

FLOODWAY DATA

VERDE RIVER

BEST DOCUMENT AVAILABLE

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

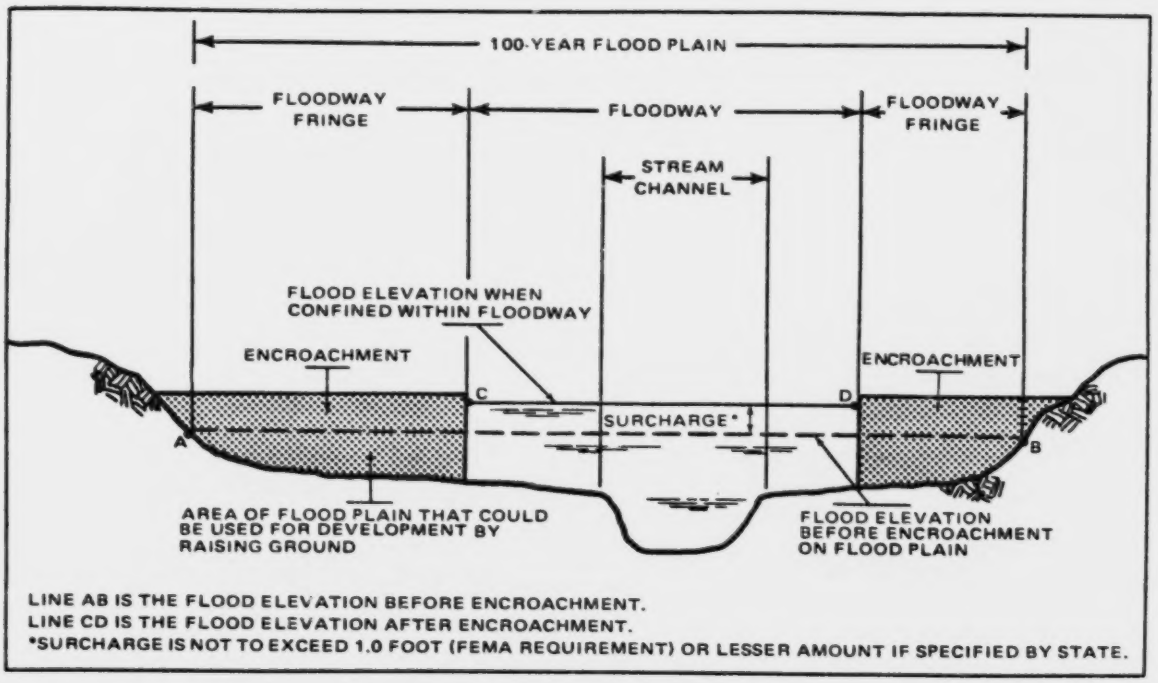
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 2. Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Emergency Management Agency has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each flooding source studied in detail affecting Clarkdale.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of Clarkdale are shown on the Flood Profiles (Exhibit 1) and summarized in Table 3.

5.2 Flood Hazard Factors

The FHF is the Federal Emergency Management Agency device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of Clarkdale was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zones A2-A4, and A17:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Verde River							
Reach 1	0001	-8.7	-2.8	7.3	085	A17	Varies - See Map
Deception Wash							
Reach 1	0001	-2.0	-0.9	4.3	020	A4	Varies - See Map
Reach 2	0001	-1.3	-0.5	2.9	015	A3	Varies - See Map
Bitter Creek							
Reach 1	0001	-2.1	-0.9	4.5	020	A4	Varies - See Map
Bitter Creek-South Fork							
Reach 1	0001	-1.3	-0.5	2.9	015	A3	Varies - See Map
Reach 2	0001	-2.0	-0.9	3.7	020	A4	Varies - See Map
Reach 3	0001	-1.2	-0.6	2.3	010	A2	Varies - See Map

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

FLOOD INSURANCE ZONE DATA

VERDE RIVER-DECEPTION WASH-BITTER CREEK-BITTER CREEK-SOUTH FORK

flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

The flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are summarized in Table 3.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for Clarkdale is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Emergency Management Agency.

6.0 OTHER STUDIES

The only other study completed for Clarkdale is a report prepared by the U.S. Army Corps of Engineers entitled Floodplain Information, Verde River and Tributaries, Vicinity of Clarkdale and Cottonwood, Yavapai County, Arizona (Reference 10). This report covers some areas being studied for the Federal Emergency Management Agency study. A comparison of base flood elevations and flood profiles presented in this study with those obtained by the U.S. Army Corps of Engineers shows general disagreement between the two studies. The source of these differences was mainly attributed to differences in expected accuracy obtainable from the topographic information utilized to complete the two studies. The U.S. Army Corps of Engineers utilized a topographic map at a scale of 1:4800, with a contour interval of 5 feet. The study contractor for the Federal Emergency Management Agency study for Clarkdale utilized a topographic map at a scale of 1:2400, with a contour interval of 2 feet. The discrepancy in flow profiles between the results obtained by the U.S. Army Corps of Engineers and the study contractor was resolved through communications with the U.S. Army Corps of Engineers, Los Angeles District office.

Flood Insurance Studies are being prepared for the Town of Cottonwood (Reference 11) and for Yavapai County, Arizona (Reference 7), and will agree with this report.

Flood boundary delineations for this study supersede the Federal Emergency Management Agency Flood Hazard Boundary Map (Reference 8).

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, 211 Main Street, Room 220, San Francisco, California 94105.

8.0 BIBLIOGRAPHY AND REFERENCES

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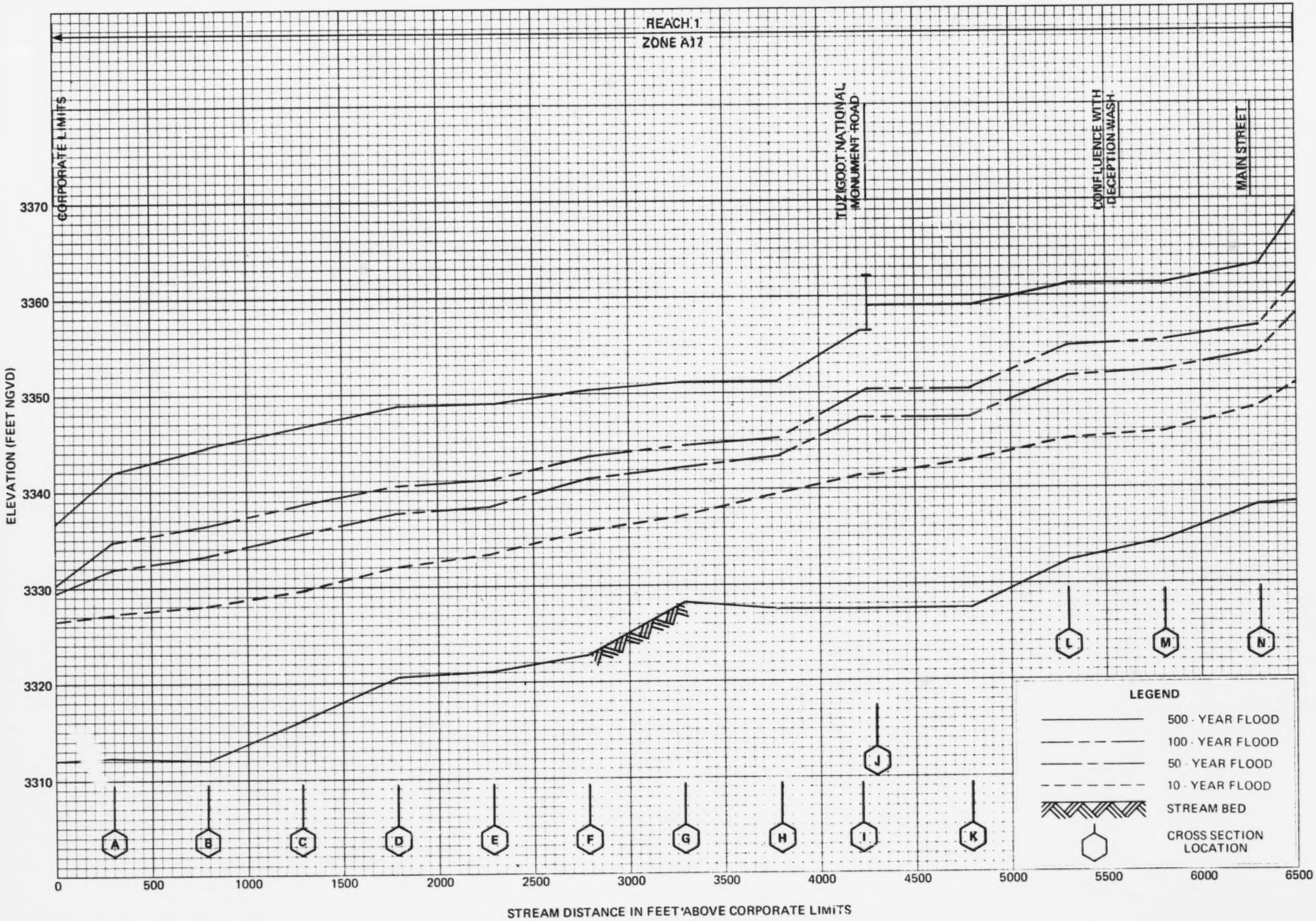

FLOOD PROFILES

VERDE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

01P

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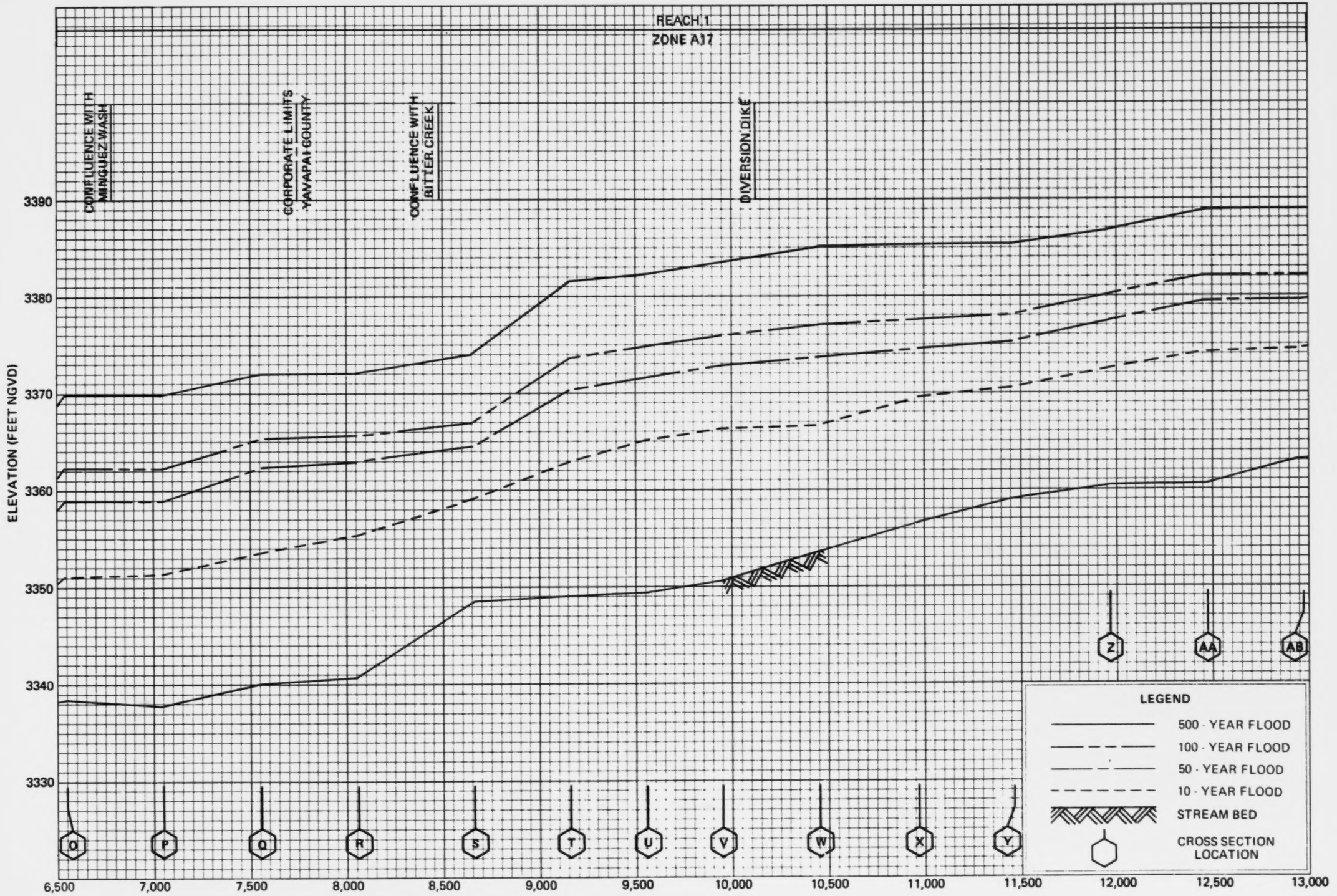

FLOOD PROFILES

VERDE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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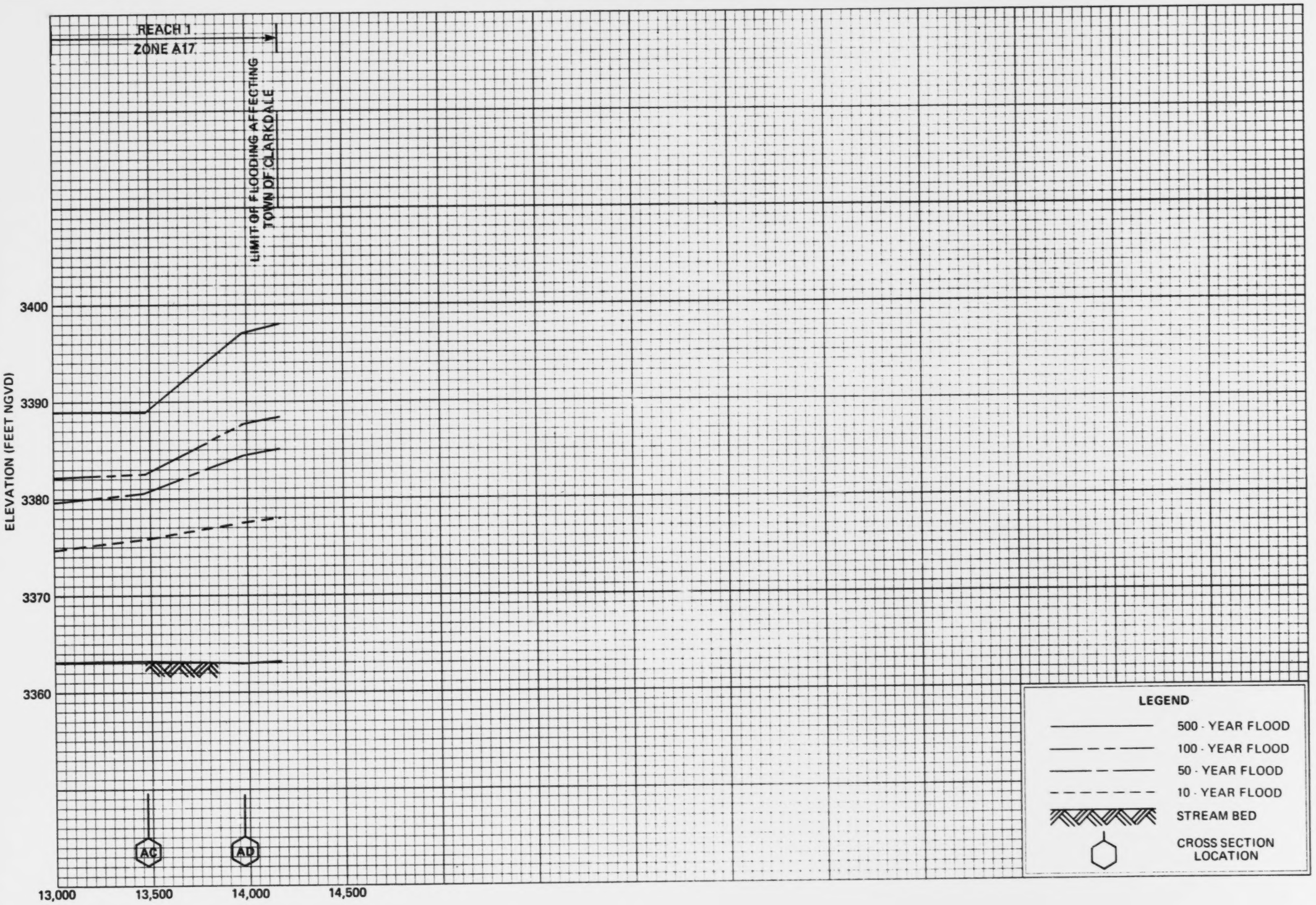

FLOOD PROFILES

VERDE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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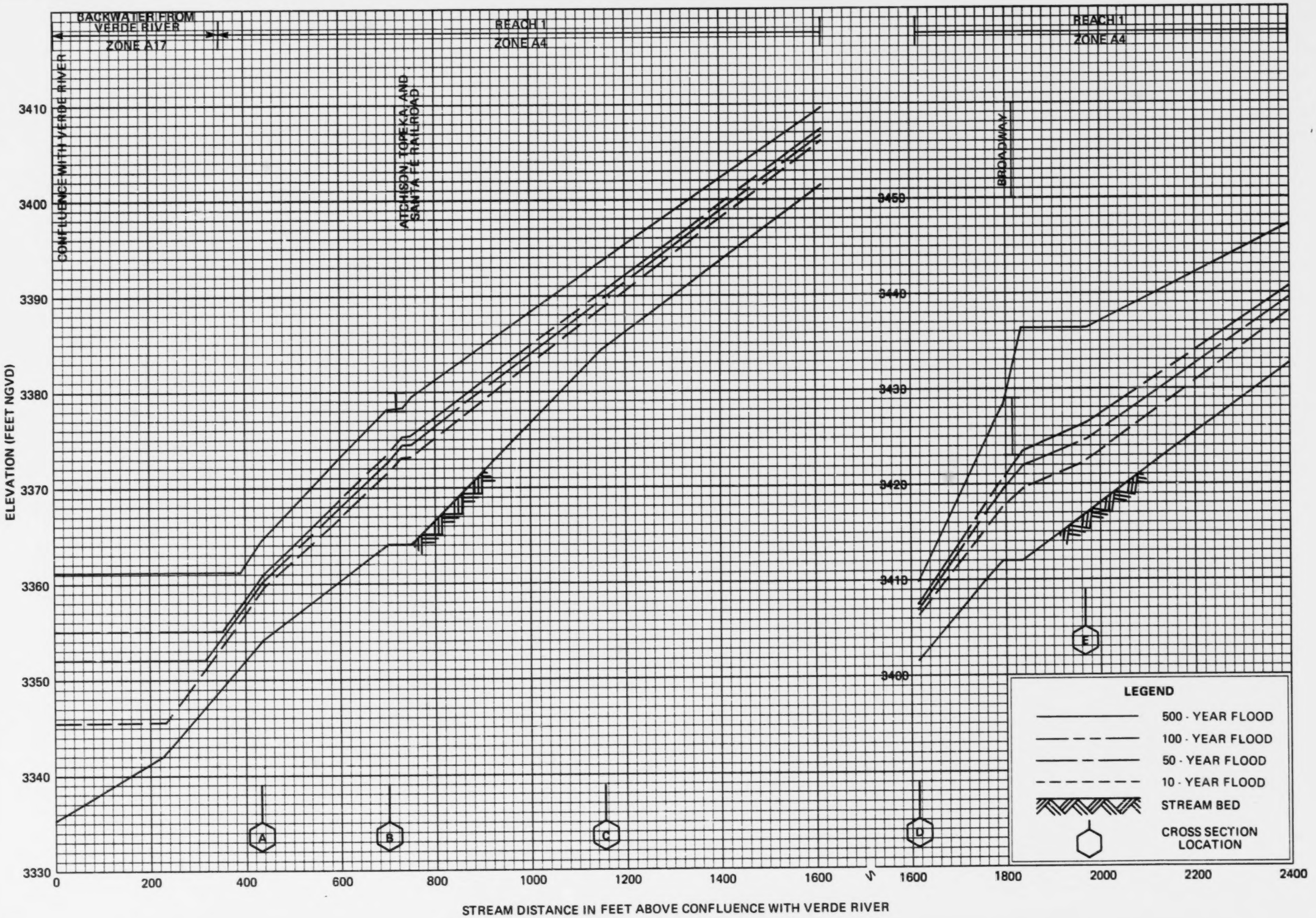

FLOOD PROFILES

DECEPTION WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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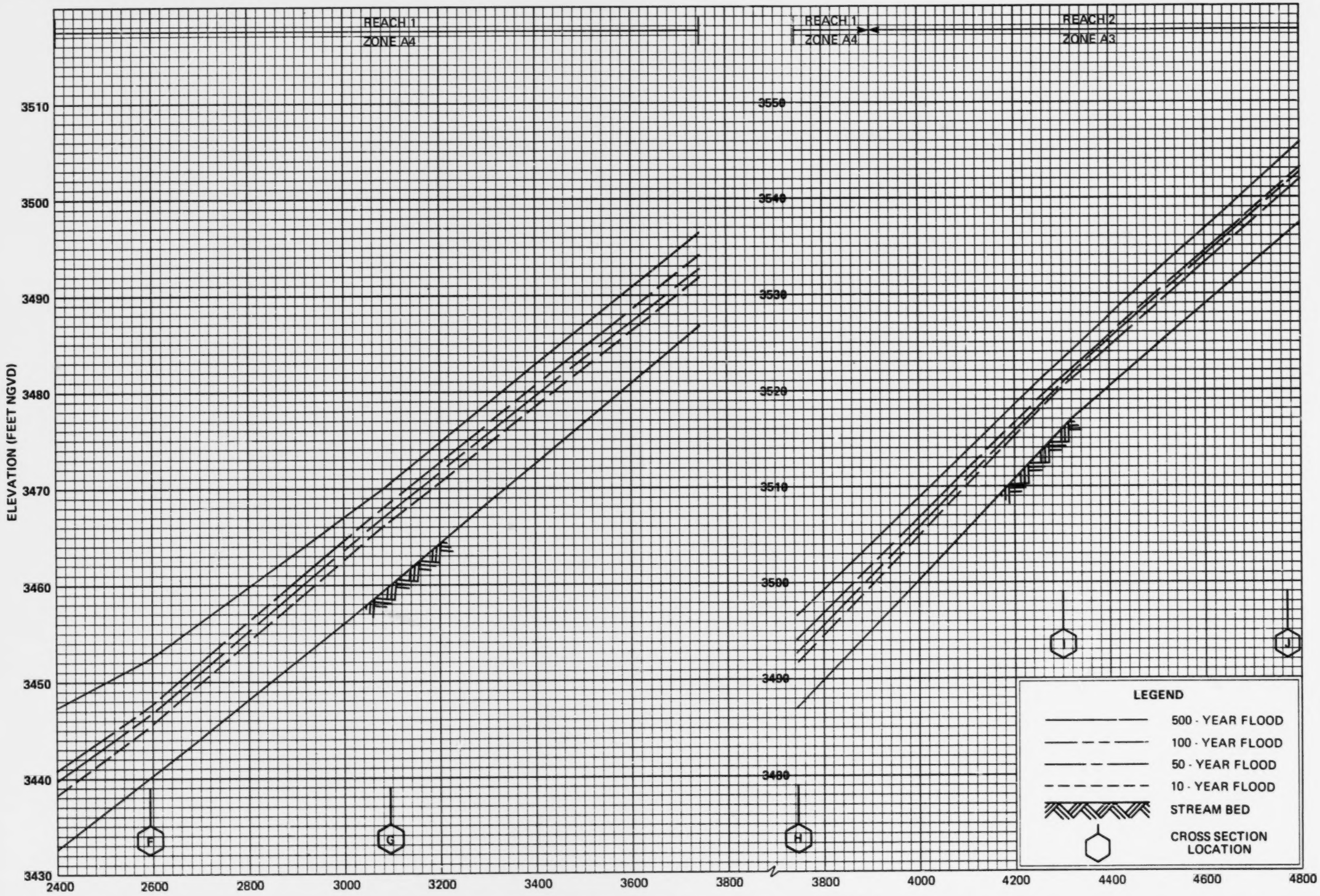

FLOOD PROFILES

DECEPTION WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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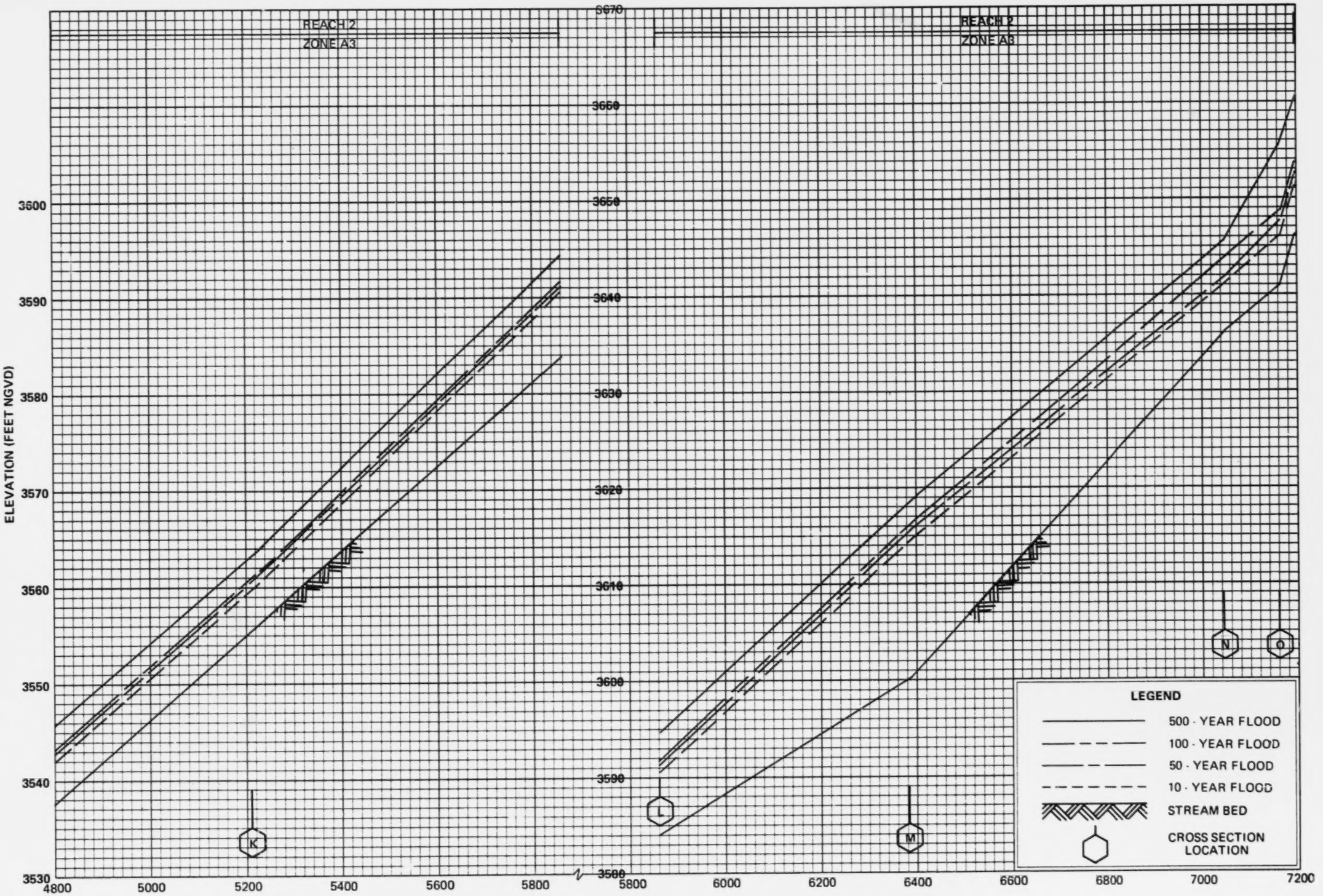

FLOOD PROFILES

DECEPTION WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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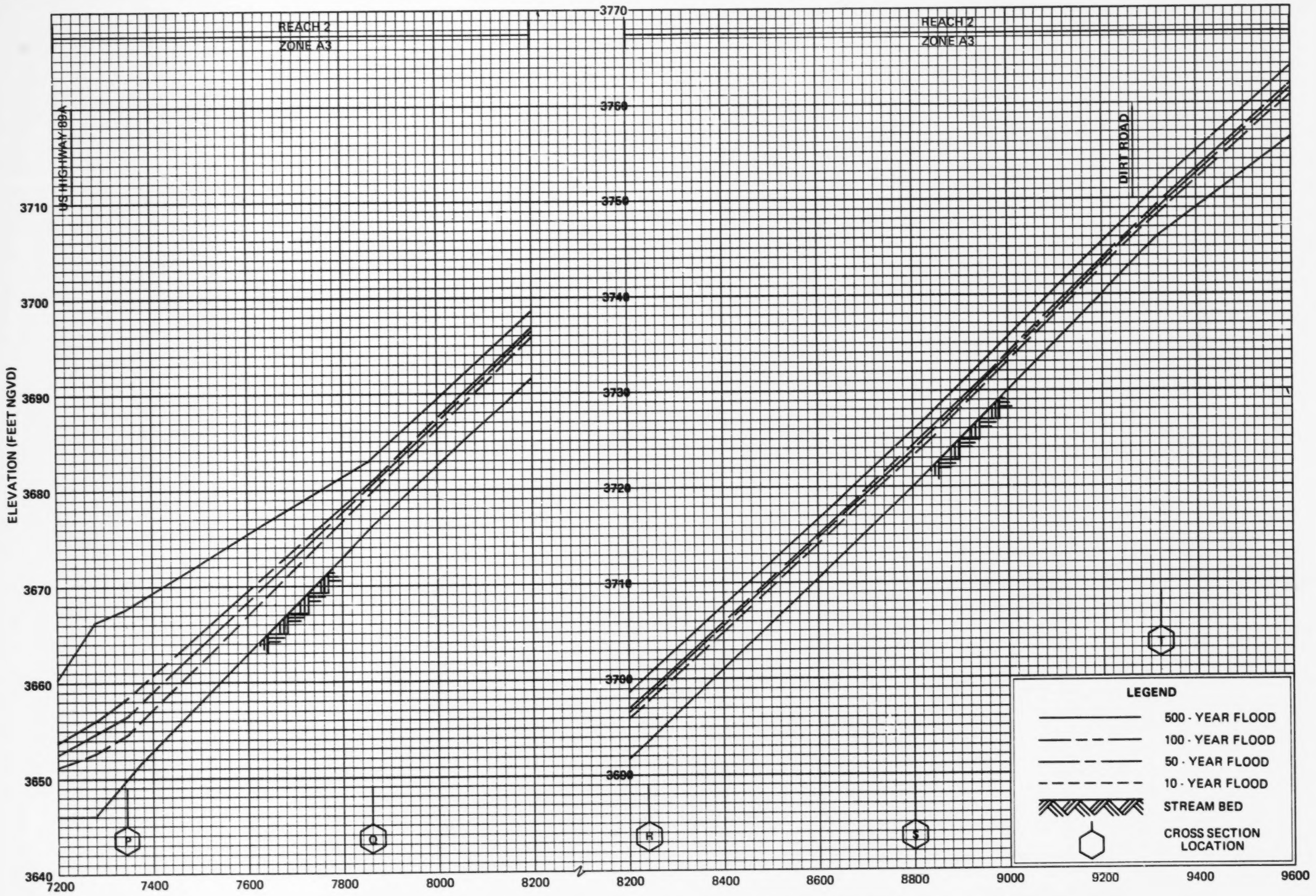

FLOOD PROFILES

DECEPTION WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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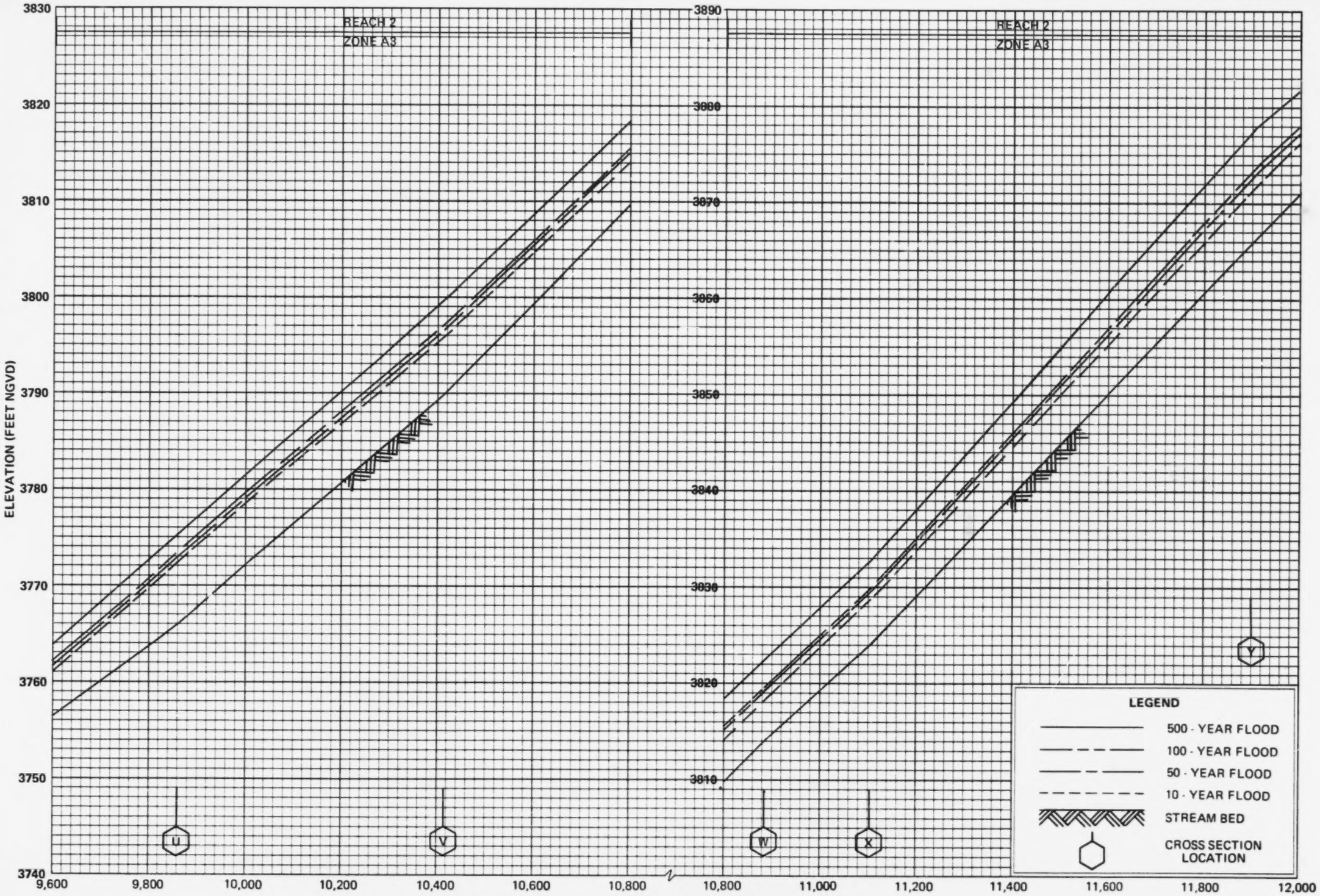

FLOOD PROFILES

DECEPTION WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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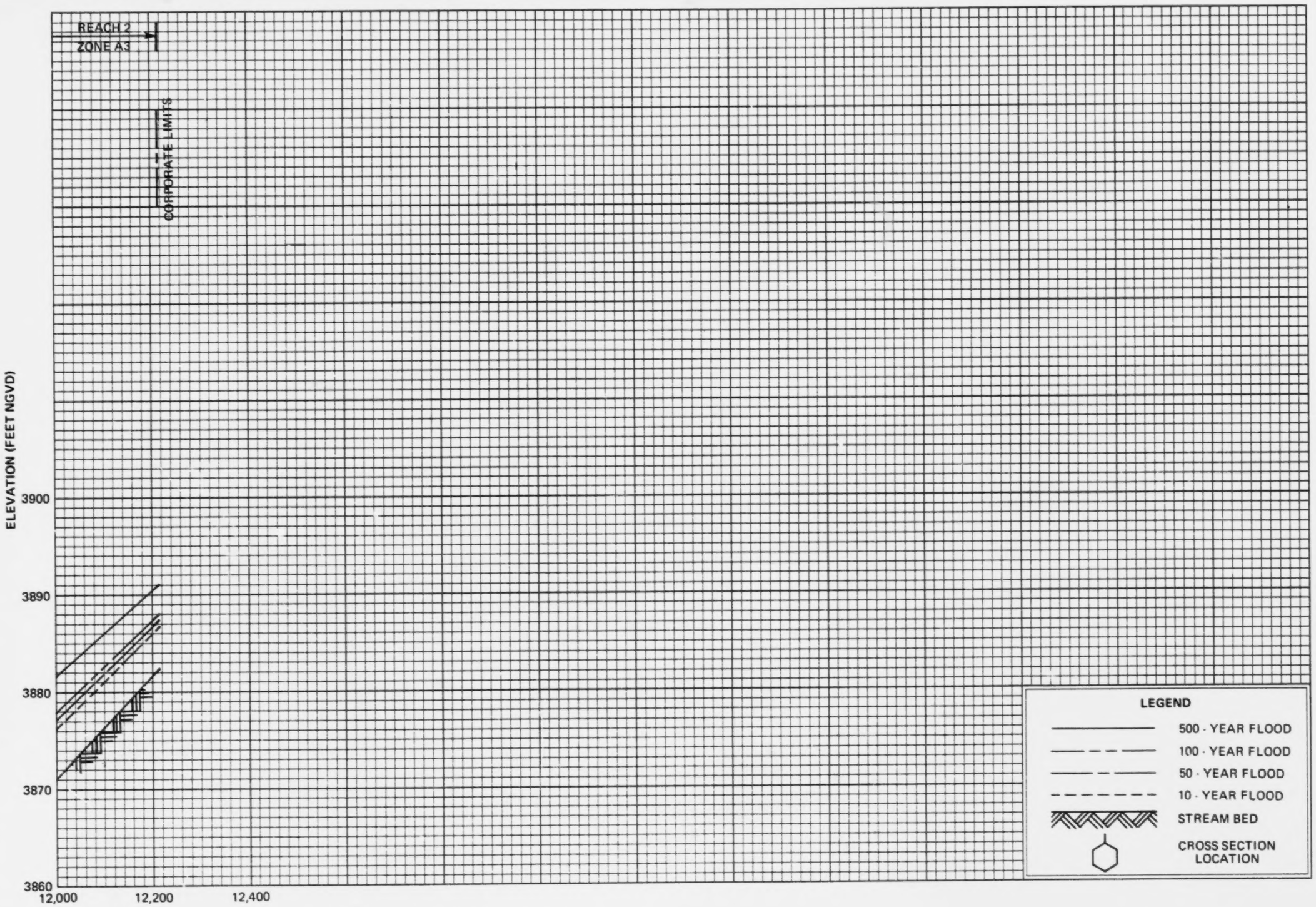

FLOOD PROFILES

DECEPTION WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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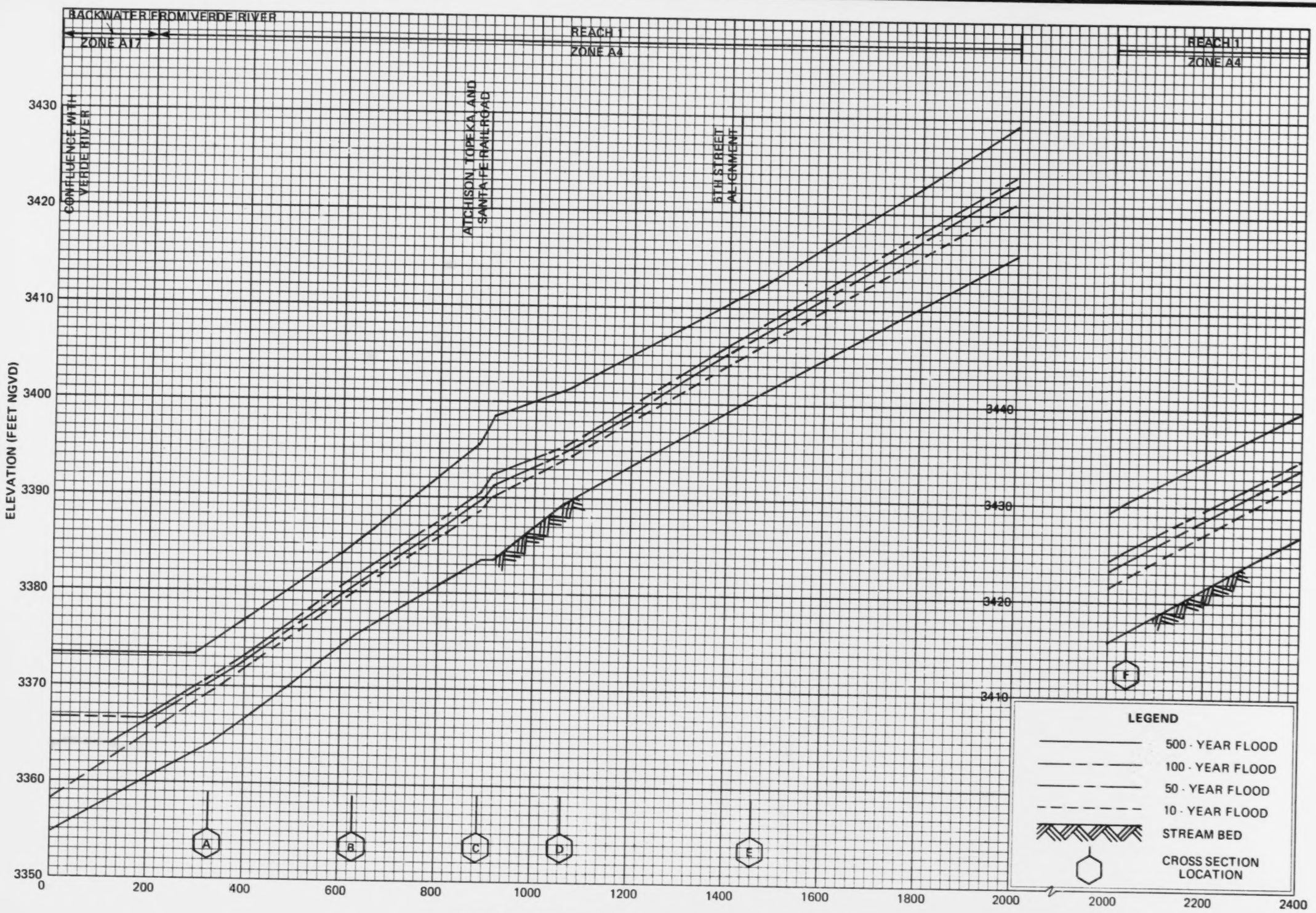

FLOOD PROFILES

BITTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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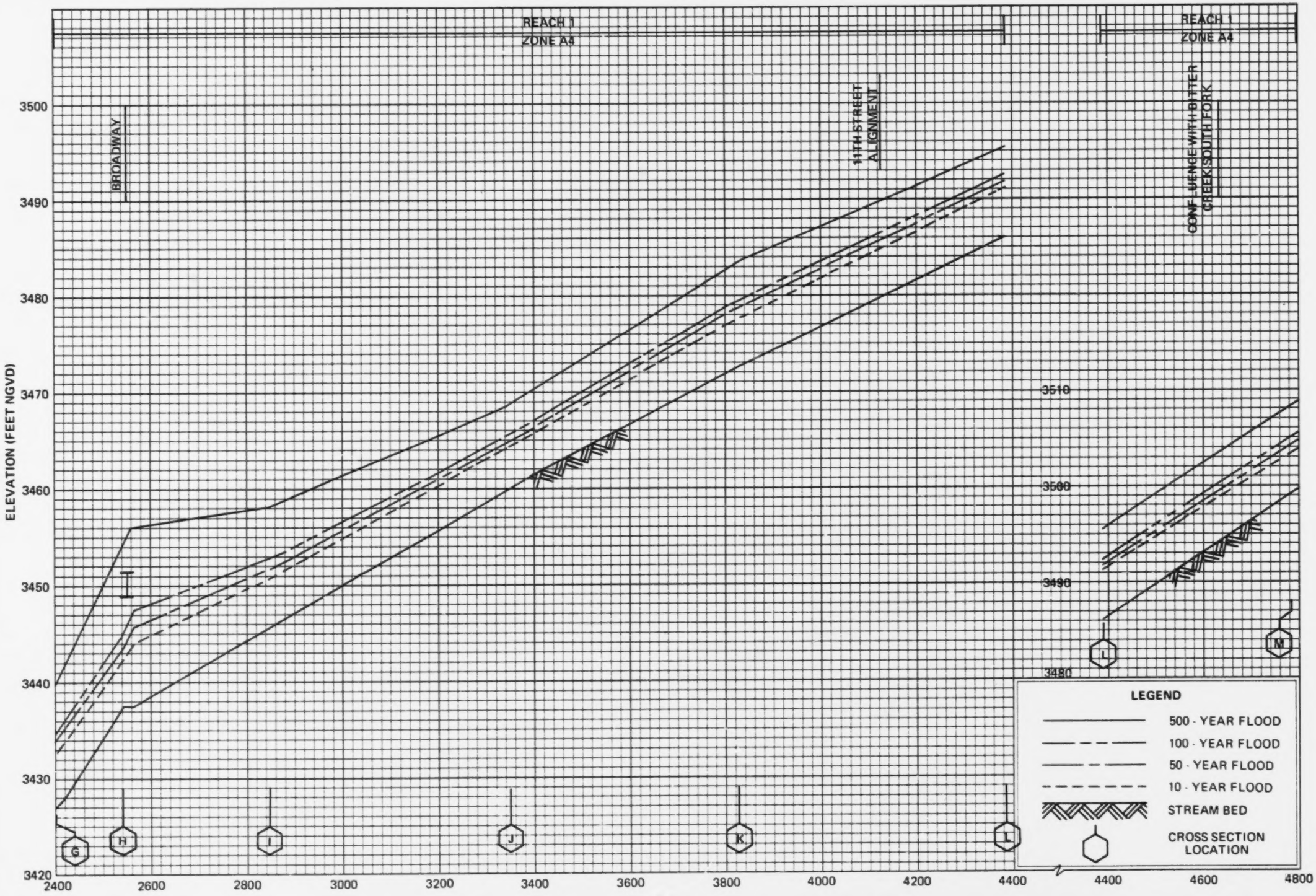

FLOOD PROFILES

BITTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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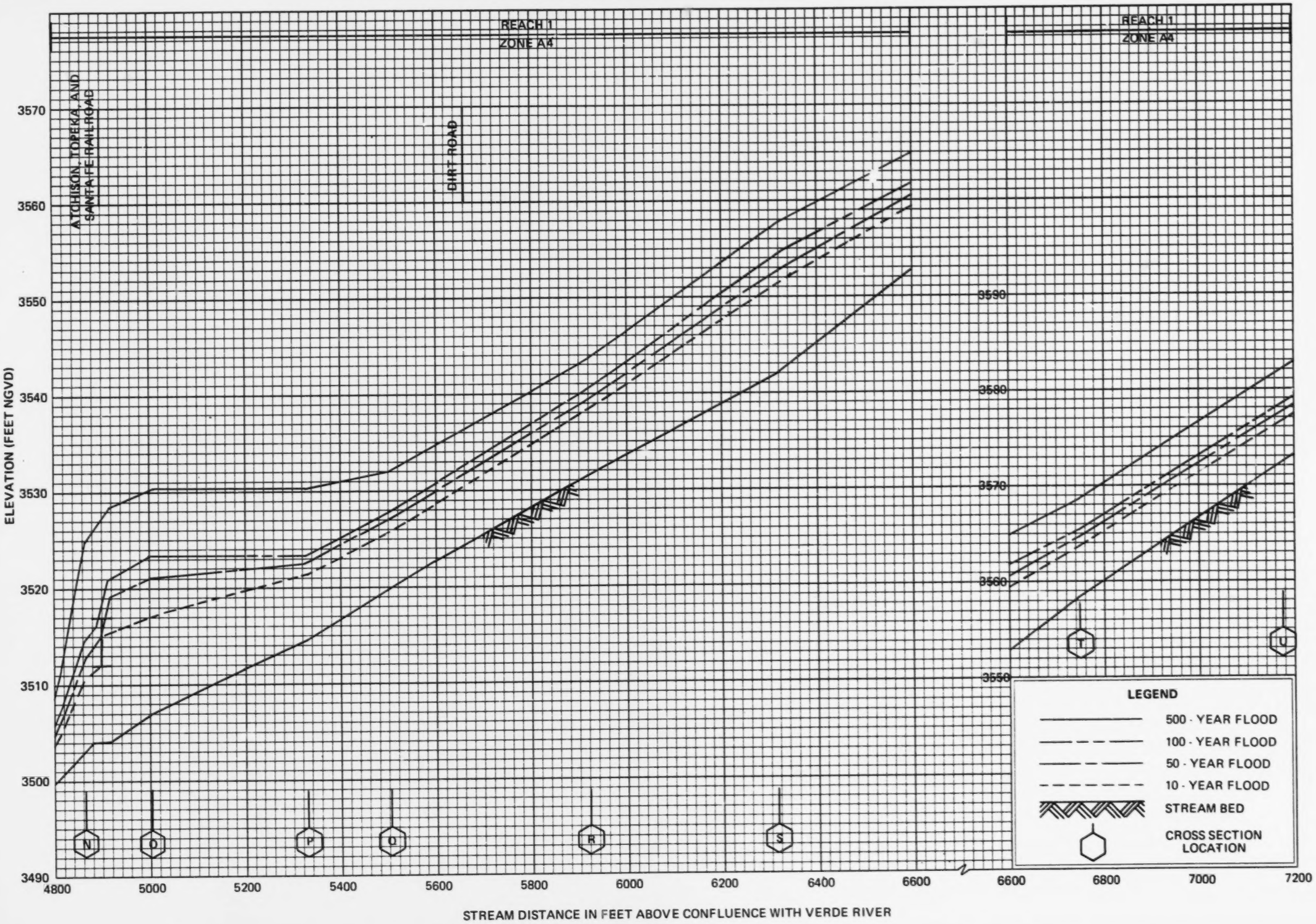

FLOOD PROFILES

BITTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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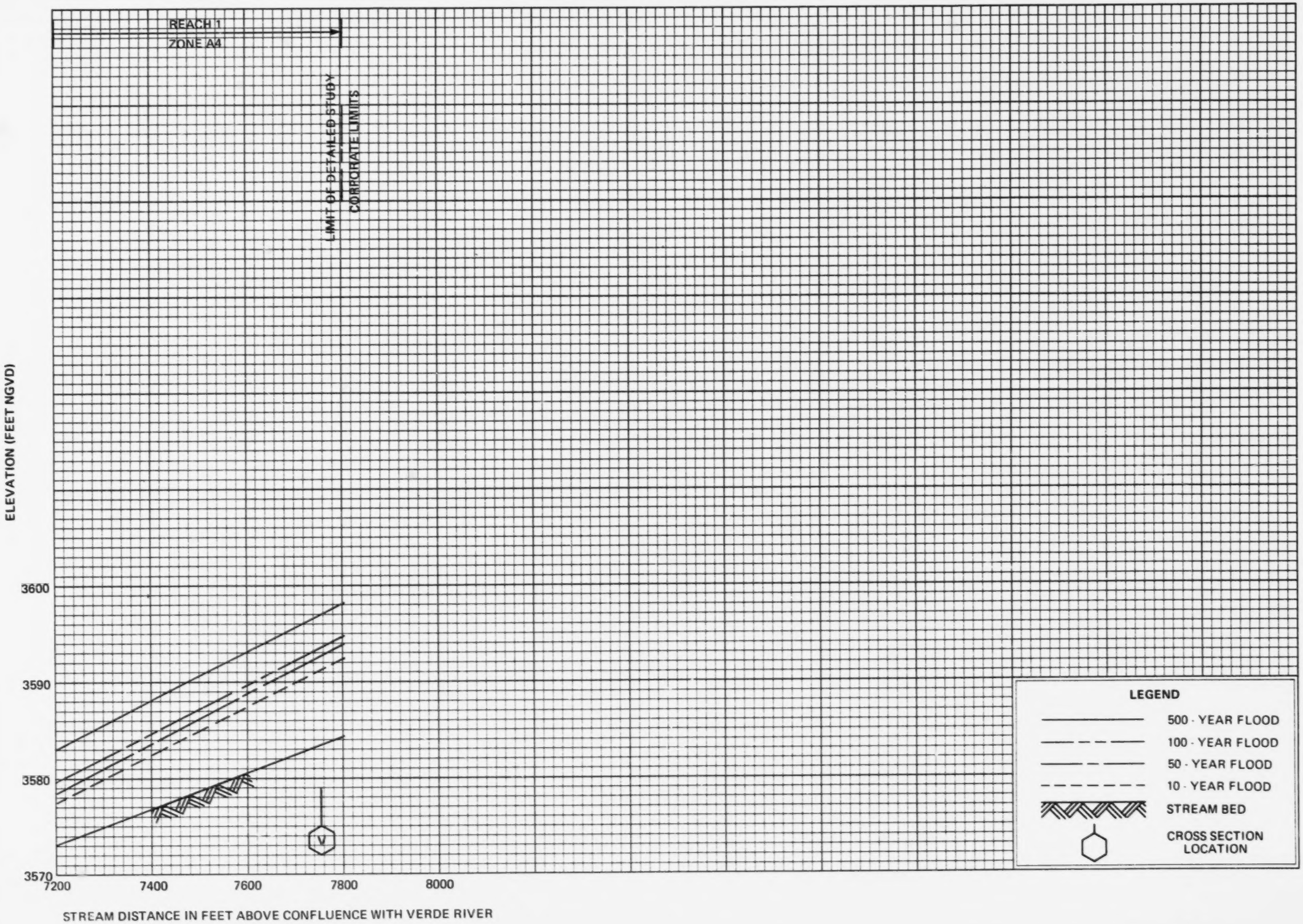

FLOOD PROFILES

BITTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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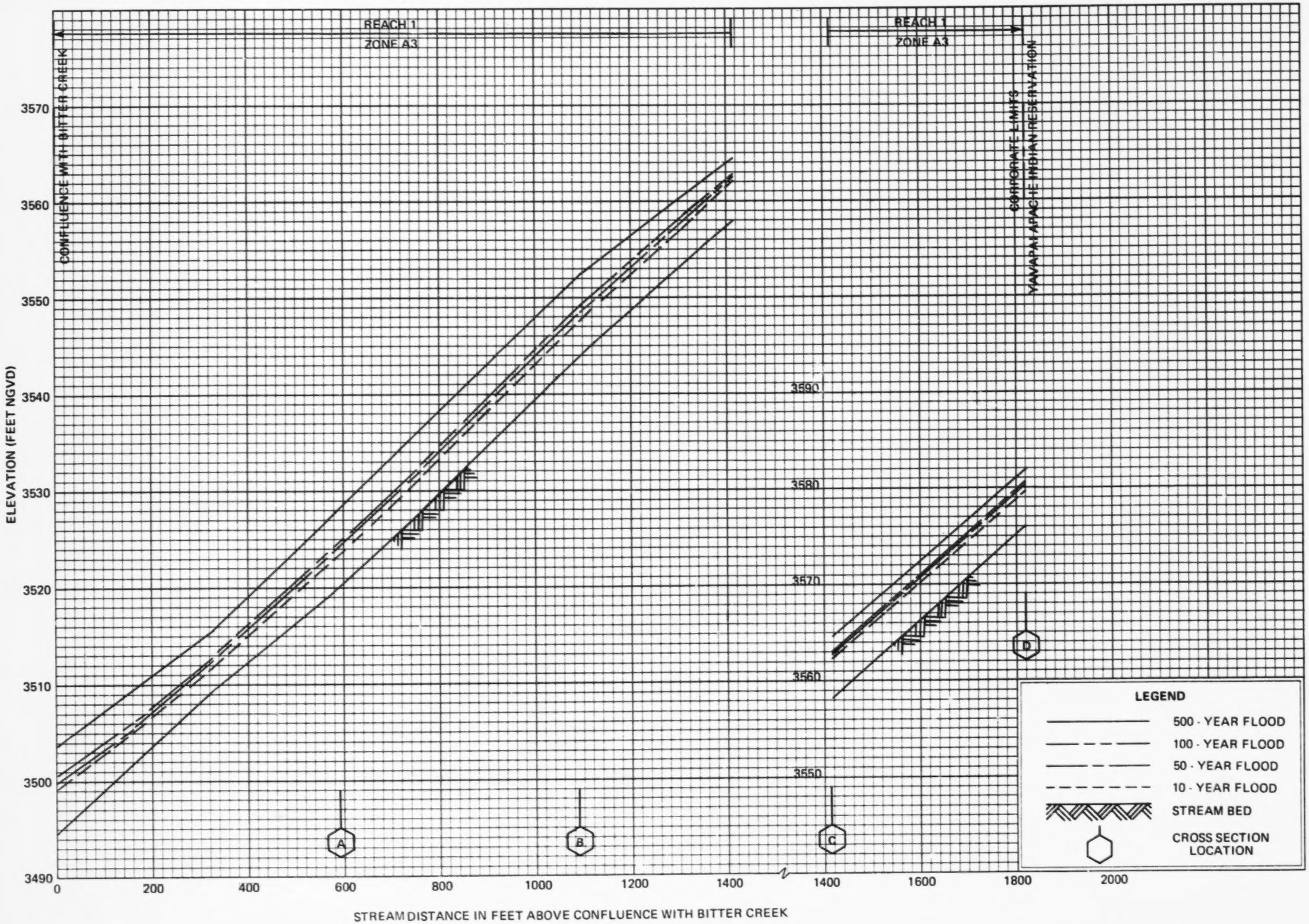

FLOOD PROFILES

BITTER CREEK-SOUTH FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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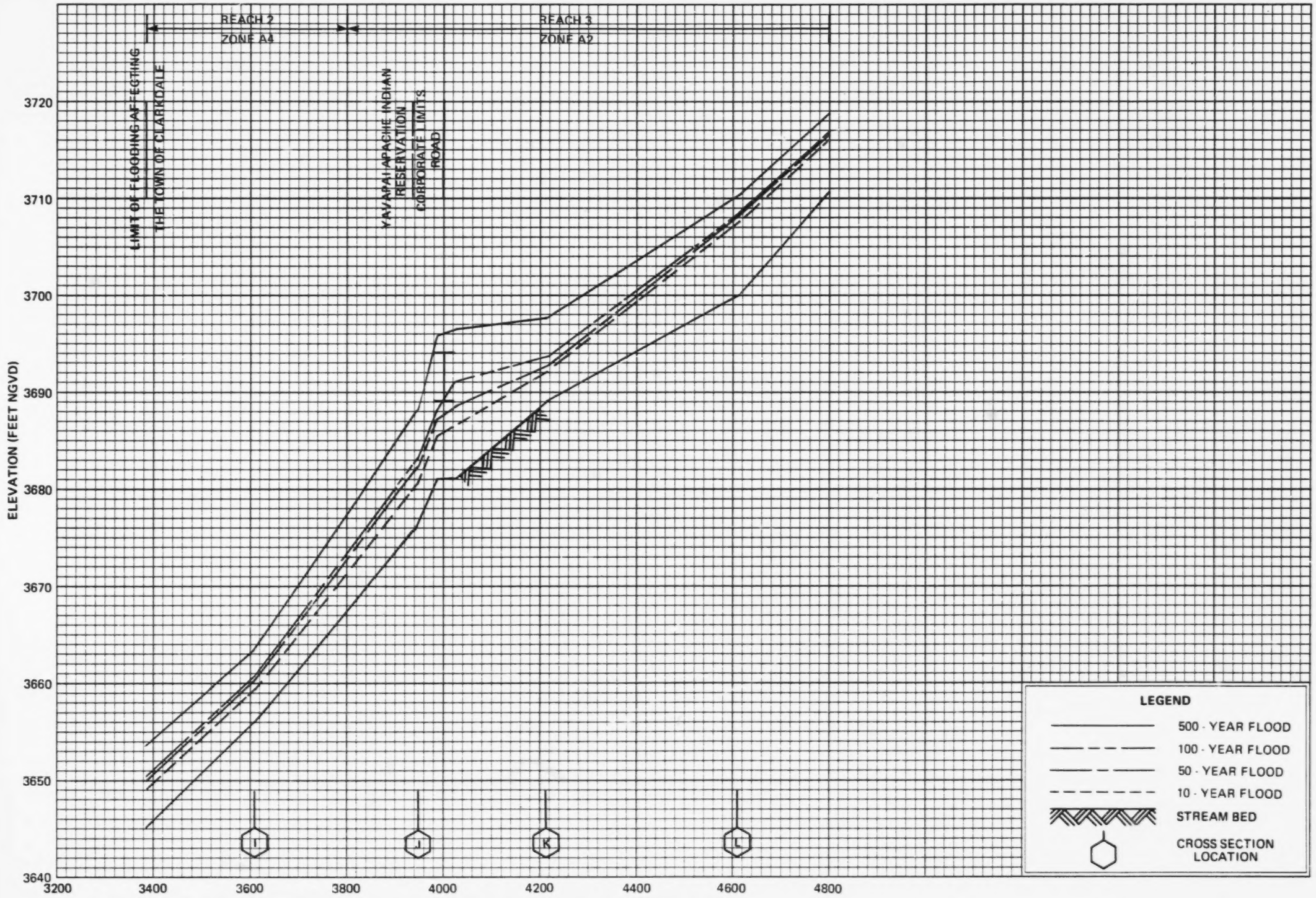

FLOOD PROFILES

BITTER CREEK-SOUTH FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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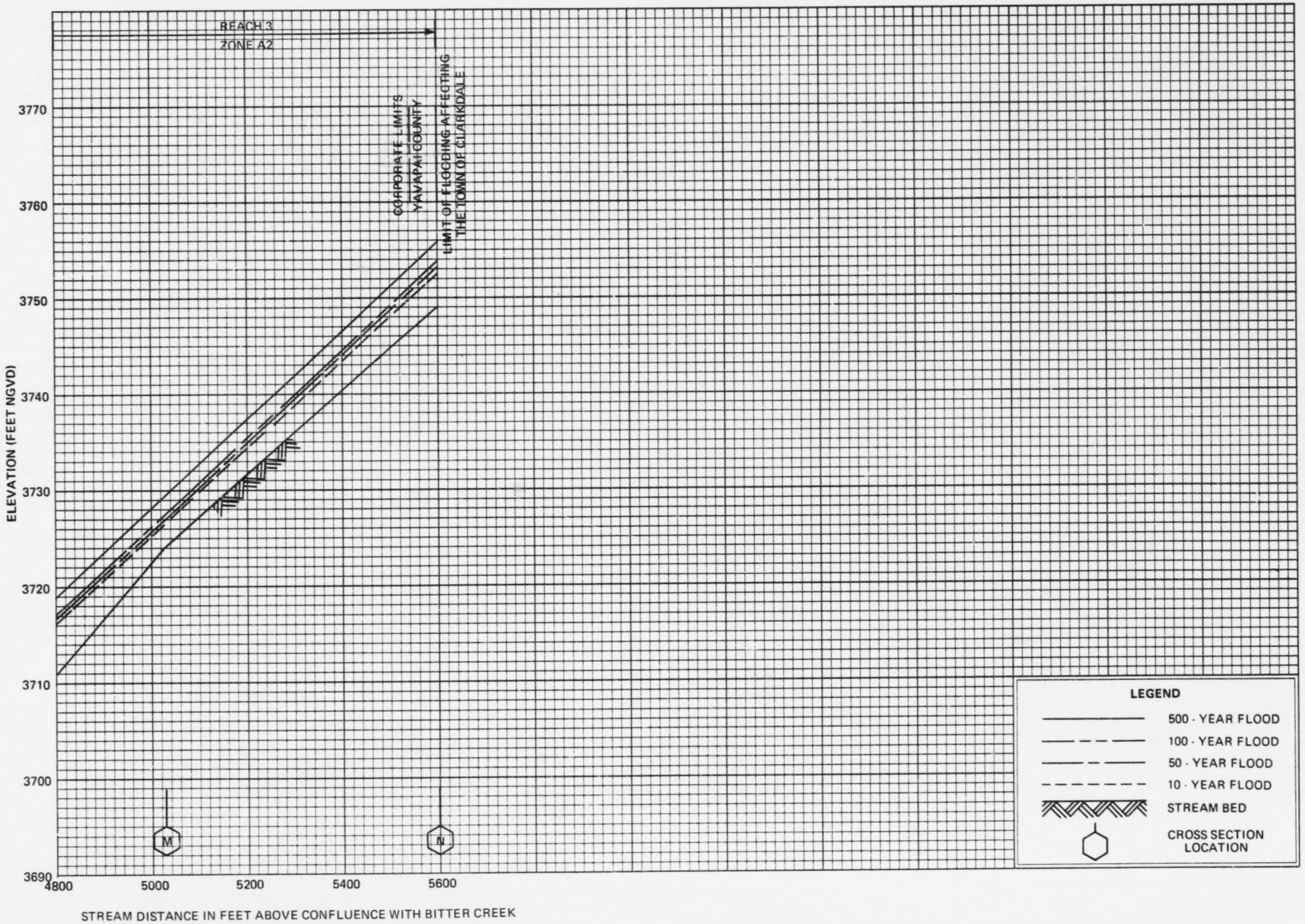

FLOOD PROFILES

BITTER CREEK-SOUTH FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLARKDALE, AZ
(YAVAPAI CO.)

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